

WHAT IS CLAIMED IS:

1. A method of acquiring interferogram data in a Fourier transform spectrometer, the spectrometer including a detector that provides an output signal that exhibits non-linear distortion in a measured interferogram represented by a power series $I_m = a_1 I + a_2 I^2 + a_3 I^3 + \dots$, comprising the steps of:
 - representing a measured spectrum as $S_m = a_1 S + a_2 (S * S) + a_3 (S * S * S) + a_4 (S * S * S * S) + \dots$ where S is the spectrum of the linear interferogram and $*$ indicates convolution;
 - expressing a linear interferogram I as a power series of a measured interferogram I_m as $I = b_1 I_m + b_2 I_m^2 + b_3 I_m^3 + \dots$;
 - expressing the linear spectrum as a power series of the spectra of the interferogram powers $S = b_1 S_1 + b_2 S_2 + b_3 S_3 + \dots$;
 - measuring the non-linear effects of the detector from one or more resolution elements in spectral regions known to have no energy; and
 - obtaining the coefficients b_i where $S = 0$ by applying the measured non-linear effects to $S = b_1 S_1 + b_2 S_2 + b_3 S_3 + \dots$.
2. The method of claim 1 wherein:
 - a set of m measurements from 1 to $n + 1$ is selected from the spectra of the powers of the measured interferogram where $S = 0$; and
 - making $b_1 = 1$ and $m = n$.

3. The method of claim 1 wherein:
a set of m measurements from 1 to $n + 1$ is selected from the spectra of the powers of the measured interferogram where $S = 0$;
 $m > n$;
- 5 and the least square approximation is used to find b_i .
4. The method of claim 1 wherein:
for each measurement of the measured spectra the average of 2 or more resolution elements in the spectra of the powers of the measured interferogram is used
- 10 to compute b_i .
5. The method of claim 1 wherein:
the measured interferogram is collected by an AC signal channel and a DC offset is taken from the measured interferogram collected by a DC coupled signal
- 15 channel.
6. The method of claim 1 wherein:
the detector is a single point detector.
- 20 7. The method of claim 1 wherein:
the detector is a one dimensional detector.

8. The method of claim 1 wherein:
the detector is a two dimensional detector.
9. The method of claim 1 wherein:
5 the detector is a photovoltaic detector.
10. The method of claim 1 wherein:
the detector is a photoconducting detector.
- 10 11. The method as in claim 1 wherein:
the detector is a bolometric detector.
12. A Fourier transform spectrometer comprising:
an interferometer;
15 a reference electromagnetic radiation source;
an infrared radiation source;
a detector that provides an output signal from the reference and infrared
sources that exhibits a non-linear variation;
a preamplifier circuit, responsive to the output signal, producing an output
20 signal;
an amplifier circuit, responsive to the preamplified signal, producing an output
signal;

means for digitizing the amplified output signal to provide a measured interferogram;

signal processing means for acquiring interferogram data wherein the measured interferogram is represented as a measured spectrum $S_m = a_1 S + a_2 (S*S) + a_3(S*S*S) + b_3 (S*S*S*S) + \dots$ wherein S is the spectrum of the linear interferogram and $*$ indicates convolution, a linear interferogram I is expressed as a power series of a measured interferogram I_m as in $I = b_1 I_m + b_2 I_m^2 + b_3 I_m^3 + \dots$, the linear spectrum is expressed as a power series of the spectra of the interferogram powers $S = b_1 S_1 + b_2 S_2 + b_3 S_3 \dots$, and the coefficients b_i are computed where $S = 0$.

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13. A Fourier transform spectrometer as in claim 12 wherein:

the signal processing means selects a set of m measurements from 1 to $n + 1$ from the spectra of the powers of the measured interferogram where $S = 0$; and
makes $b_1 = 1$ and $m = n$.

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14. A Fourier transform spectrometer as in claim 12 wherein:

the signal processing means selects a set of m measurements from the spectra of the powers of the measured interferogram from 1 to $n + 1$ where $S = 0$; and
makes $m > n$; and

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uses the least square approximation to find b_i .

15. A Fourier transform spectrometer as in claim 12 wherein:
the signal processing means uses for each measurement of the measured
spectra the average of 2 or more resolution elements in the spectra of the powers of the
5 measured interferogram to compute b_i .
16. A Fourier transform spectrometer as in claim 12 wherein:
the amplifier uses an AC signal channel.
- 10 17. A Fourier transform spectrometer as in claim 16 wherein:
a DC offset is taken from the measured interferogram collected by a DC
coupled amplifier.
- 15 19. A Fourier transform spectrometer as in claim 12 wherein:
the detector is a single point detector.
19. A Fourier transform spectrometer as in claim 12 wherein:
the detector is a one dimensional detector.
- 20 20. A Fourier transform spectrometer as in claim 12 wherein:
the detector is a two dimensional detector.

21. A Fourier transform spectrometer as in claim 12 wherein:
the detector is a photovoltaic detector.
22. A Fourier transform spectrometer as in claim 12 wherein:
5 the detector is a photoconducting detector.
23. A Fourier transform spectrometer as in claim 12 wherein:
the detector is a bolometric detector.

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